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Buying Drugs Online in the Age of Social Media

See also Mackey et al., p. 1910.

In 1974, an Australian television reporter asked science fiction writer Arthur C. Clarke what the year 2001 might be like for his young son. Over the whirring of enormous mainframes, Clarke responded by describing what we now call the Internet, saying that the boy would have a computer console in his home providing "all the information he needs for his everyday life, like his bank statements, his theater reservations, all the information you need in the course of living in a complex modern society." Since Clarke's prescient forecast, the Internet has become dominant in our daily lives. It has transformed our routines of buying and selling goods and services, displacing brick-and-mortar stores, and rendering the suburban mall a near anachronism. Like virtually all commercial venues in human history, the Internet also has become a means to buy and sell contraband—namely, drugs.

ILLICIT ONLINE PHARMACIES

The rise of online pharmacies advertising controlled substances to the public without a prescription (termed illicit online pharmacies) was documented in a series of reports from the early 2000s.[1] Purporting to be legitimate businesses, pharmacy Web sites often contained images of smiling people in laboratory coats offering safe and confidential shipment of medications. However, the reality was quite different, with many orders never arriving or yielding tablets containing entirely different ingredients from those expected.[1] When delivered, medications often came in haphazard packaging such as loose tablets in a plastic sandwich bag.

Recognizing the threat to public health and safety, law enforcement agencies have engaged in large-scale operations to shut down illicit online pharmacies. Coordinated by INTERPOL and now involving more than 100 countries globally, Operation Pangea is an annual campaign to seize illicit and counterfeit pills and take down illicit online pharmacy Web sites.[2] In 2012, Operation Pangea V resulted in the seizure of 3.75 million illicit and counterfeit pills worth an estimated $10.5 million, in addition to the shutdown of more than 18 000 Web sites. Since that time, the volume of illicit and counterfeit pills seized has only grown. However, despite such enforcement activities, illicit online pharmacies persist.

In this issue of *AJPH*, Mackey et al. (p. 1910) describe the use of machine learning to identify illicit online pharmacies from social media. Drawing on a pool of more than 600 000 tweets about opioids from a five-month period, the investigators used topic modeling —an analysis to identify clusters of co-occurring words in a body of text—to identify tweets specifically about the sale of illicit opioids. From these tweets, the investigators then reviewed those linking to external Web sites and found seven unique Web sites offering opioid analgesics for sale without a prescription.

Previous studies relied on manual review of links from Internet search engines, an extremely time-consuming and imprecise method.[1] Mackey et al. mined an immense volume of data through machine learning, which quickly identified tweets of interest. Years of enforcement activity have forced illicit online pharmacies to find new ways of advertising, so big data analytics approaches such as this one are valuable.

HEALTH INFORMATION FROM TWITTER

More broadly, the study by Mackey et al. adds to the growing body of evidence that seemingly mundane information posted to Twitter can provide meaningful health information.[3] Specifically regarding drug use, social media presents an extraordinary opportunity to learn about the behavior and social networks of people who presumably use drugs and seek them out online. Several natural extensions of the work by Mackey et al. are apparent, including time trend and geographic variation analyses, examination of the use of slang terms, and research to understand the uptake and diffusion of tweets about drug use across social networks.

Nonetheless, health research involving data on Internet users' behavior has already run into pitfalls. In a prominent example, Lazer et al.[4] described the fall

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of Google Flu Trends, which was created to predict rates of influenza-like illness from the volume of certain search terms. Although their approach was appealing, the numerous search terms examined likely yielded spurious correlations, and the volume of search terms was subject to external forces such as media attention. Google's own search algorithm also changed as did the search habits of its users; over time, Flu Trends became highly inaccurate. Twitter presents some similar challenges because the types of people using it and their modes of expression are constantly changing. The findings by Mackey et al., therefore, should be viewed as living, with future research developing in parallel with the natural evolution of social media platforms and users.

CRYPTOMARKETS AND THE FUTURE OF DRUG USE

Currently, because enforcement activities have targeted illicit online pharmacies, the market has adapted, namely, through cryptomarkets. Cryptomarkets are online venues for the purchase of drugs (and other contraband) protected by technology allowing for anonymous communication (e.g., Tor software, Seattle, WA) and using currency designed to be difficult to trace (i.e., cryptocurrencies such as Bitcoin). These markets often have fully developed systems of customer feedback and dispute resolution. Although illicit online pharmacies traded in pharmaceuticals, cryptomarkets offer access to a broader range of drugs, including cannabis products, 3,4-methylenedioxymethamphetamine (MDMA), cocaine, and amphetamines.

What do cryptomarkets mean for the future of drug use? In a recent review, Aldridge et al.[5] argued that cryptomarkets could increase the prevalence of drug use in three ways: (1) by providing access to drugs for customers who could not access them in their own neighborhoods, (2) by providing access to drugs for customers who otherwise would not purchase them offline, and (3) by facilitating wholesale cryptomarket purchases by offline dealers, leading to increases in local availability. However, cryptomarkets may provide benefits as well, with preliminary evidence suggesting a higher purity of cryptomarket-obtained drugs relative to those obtained offline (possibly resulting from pressure on sellers to sell high-purity products because systems can track and report customer feedback).[5] Given the anonymity of transactions, the threat of violence may be markedly reduced with cryptomarket compared with offline transactions, although this may be offset at least in part by an increased risk of paying for drugs not received. Given that people will continue to buy drugs, cryptomarkets may offer several personal and public health advantages over offline purchases.

When faced with an emerging venue for illicit drug sales, our impulse is to focus on law enforcement. Indeed, there have been large-scale operations against cryptomarkets, but data suggest that effects are only temporary.[6] What if we modified our approach?

Whereas physical drug markets are typically hidden, making it difficult to intervene at the point of sale, digital drug markets are often open and broadly accessible to the public. What if we could harness these venues to promote health? Interventions could potentially broadcast health-oriented messages or even connect soon-to-be customers with resources such as harm reduction advice or services or even substance use disorder treatment. Some of this work is already ongoing; for example, in 2014, a Spanish nongovernmental organization implemented a drug content and purity testing service aimed at people using cryptomarkets.[7] Research is needed to further develop and test the efficacy of such interventions and identify how best to implement and scale them.

Historically, the proportion of people obtaining drugs via the Internet has been small, but it will almost certainly grow. We are only beginning to understand the hazards and benefits of this shift. Online drug commerce and social media offer unprecedented opportunities to understand and quantify drug markets as well as the behavior and social networks of people who use drugs. Analytic techniques like the one described by Mackey et al. are useful for mining vast amounts of data to make sense of it all. AJPH

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